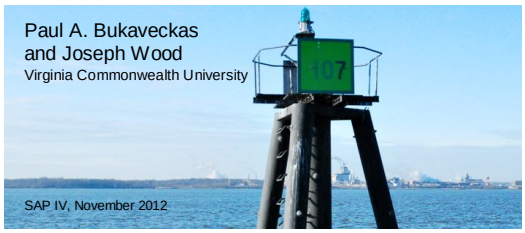
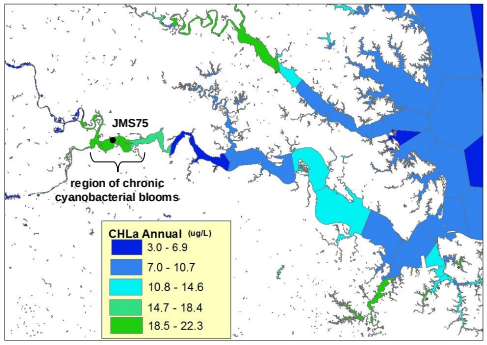
James River Chlorophyll Study: VCU 2012 Data Collection



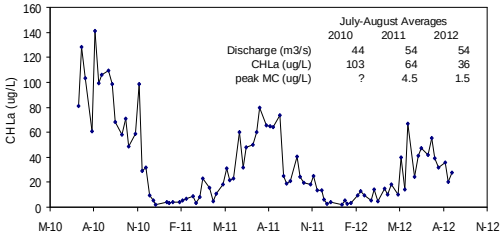
CHLa Map of the James River



2012 Work Elements

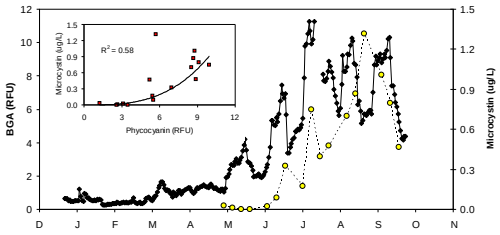
- Expanded (weekly) monitoring of CHLa, nutrients and Microcystin at JMS110,99,75,69,56 and APP1.53 (with phytoplankton samples to ODU).
- Algal bioassays to quantify nutrient limitation.
- Top-down effects: Rangia and fish grazing on CHLa.
- Microcystin and living resources.

Results - Monitoring



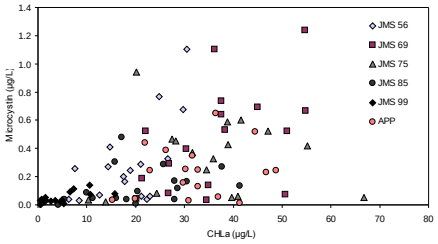
Weekly times series of CHLa at JMS75 2010-2012.

Upper James HAB Events 2012

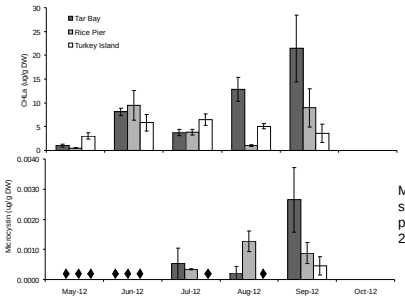


Continuous monitoring of cyanobacterial abundance (phycocyanin fluorescence) and weekly measurements of Microcystin concentration at VCU Rice Center.

Microcystin vs. CHLa



Microcystin & CHLa in Sediments



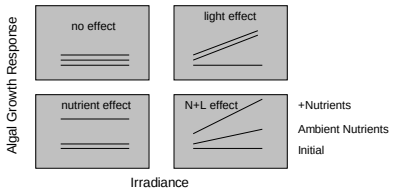
MC content of suspended particulate matter = 2-40 µg/g DW

♦ measured but not detected; sediment sample = top 2 cm.

Algal Bioassay Experiments

Key Issues for linking nutrients & CHLa:

- Dual effects of light & nutrients on algal growth rates?
- N vs. P limitation? Forms of N (NO_3, NH_4, DON)?

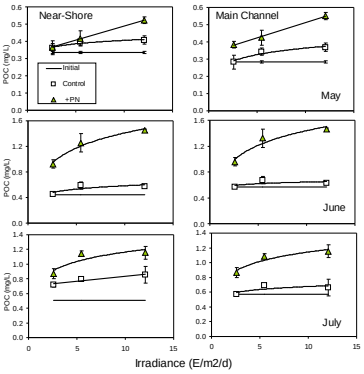


Results – Algal Bioassays

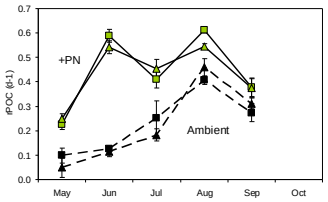
Synergistic effects of Light & Nutrients.

Other Results:

- •PN > N > P
- •DON = NO_3 = NH_4
- •Main Channel = Near-shore



Algal Bioassay Results



Mean Doubling Times:
Ambient = 1.3 d
+PN = 0.7 d

C-based algal growth rates at Ambient and enhanced nutrient concentrations show diminishing effects of nutrient addition in late summer.
Squares = near-shore (Rice); Triangles = main channel (JMS75).

Results – Consumers & Microcystin

What is the role of consumers in regulating CHLa?

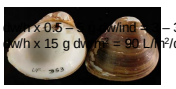
- Grazing rates of wedge clams to be used in conjunction with abundance estimates (D. Dauer, ODU) to model CHLa removal.
- Measurement of CHLa in fish gut contents to identify potentially important grazers.

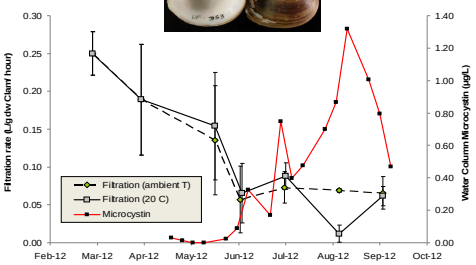
Microcystin in consumer tissues.

- Identify species susceptible to toxin effects (aquatic life impacts) and assess human health concerns.

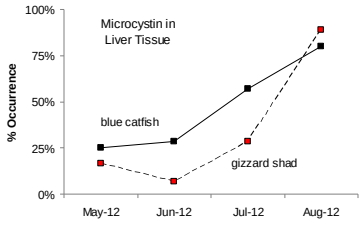
Microcystin & Filtration Rates of Rangia

0.25 L/g dw/h x 0.5 – [illegible] dw/ind = 30 L/ind/d
0.25 L/g dw/h x 15 g dw/m² = 90 L/m²/d



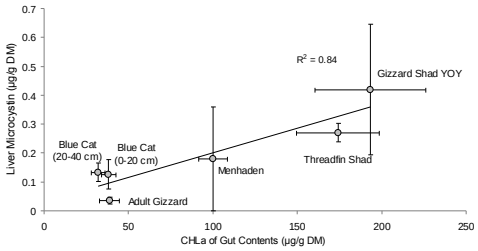


Microcystin in Fishes of the James



Proportion of individuals with measurable toxin levels.

Microcystin in Fishes of the James



Relationship between CHLa in gut contents and Microcystin in fish liver.

2012 Summary & 2013 Future Work

Activity	2012 Results	2013 Work
Bioassays	N/co- limitation	Data Analysis
Top-down Effects	CHLa ingestion rates for Rangia & fish	Estimates of fish abundance
Microcystin – monitoring	Presence in fish, Rangia and blue crabs near JMS75	How far downriver does MC contamination occur?
Microcystin - Effects	None	Experiments to assess effects on living resources.